

WHAT IS CLAIMED IS:

Sub A1
1. A self-pulsating semiconductor laser device comprising:

a semiconductor substrate of a first conductivity type;

5 a first cladding layer of said first conductivity type formed on said semiconductor substrate;

an active layer formed on said first cladding layer;

a second cladding layer of a second conductivity type formed on said active layer; and

10 a saturable absorbing layer formed on at least portions of at least one of said first cladding layer and said second cladding layer,

wherein said saturable absorbing layer is formed to have a band gap energy either approximately the same as, or
15 slightly smaller than, said active layer, and also to be doped with a high concentration of N.

Sub B1
2. The self-pulsating semiconductor laser device according to claim 1, wherein said saturable absorbing layer
20 comprises N as a group-V element.

3. The self-pulsating semiconductor laser device according to claim 1, wherein said active layer, first and second cladding layers and saturable absorbing layer comprise
25 AlGaInP alloy materials.

4. The self-pulsating semiconductor laser device according to claim 1, wherein said saturable absorbing layer comprises an AlGaInNP alloy material.

5 5. The self-pulsating semiconductor laser device according to claim 1, wherein said cladding layer comprises AlGaInP and wherein an AlGaInP intermediate layer is interposed between said cladding layer and said saturable absorbing layer, said intermediate layer containing less Al
10 than said cladding layer and no N.

Sub C7
Intended Use
6. The self-pulsating semiconductor laser device according to claim 1, wherein said self-pulsating semiconductor laser device is designed for use in an optical
15 disk system.

7. An optical disk system comprising a self-pulsating semiconductor laser device.

20 8. The optical disk system according to claim 7, wherein said self-pulsating semiconductor laser device comprises:

a semiconductor substrate of a first conductivity type;
a first cladding layer of said first conductivity type
25 formed on said semiconductor substrate;

an active layer formed on said first cladding layer;
a second cladding layer of a second conductivity type
formed on said active layer; and

a saturable absorbing layer formed on at least portions
5 of at least one of said first cladding layer and said second
cladding layer,

said saturable absorbing layer being formed to have a
band gap energy either approximately the same as, or slightly
smaller than, said the active layer, and also to be doped
10 with a high concentration of N.

9. The optical disk system according to claim 8,
wherein said saturable absorbing layer comprises N a
group-V element.

15 10. The optical disk system according to claim 8,
wherein said active layer, first and second cladding
layers and said saturable absorbing layer comprise AlGaInP
alloy materials.

20 11. The optical disk system according to claim 8,
wherein said saturable absorbing layer comprise an AlGaInNP
alloy material.

25

12. The optical disk system according to claim 8,
wherein at least said cladding layer comprises AlGaInP
and an AlGaInP intermediate layer is interposed between said
cladding layer and said saturable absorbing layer, said
5 intermediate layer containing less Al than said cladding
layer and no N.

13. A semiconductor device comprising:
a semiconductor substrate of a first conductivity type;
10 a first cladding layer of said first conductivity type
formed on said semiconductor substrate;
an active layer formed on said first cladding layer;
a second cladding layer of a second conductivity type
formed on said active layer; and
15 a saturable absorbing layer formed on at least portions
of at least one of said first cladding layer and said second
cladding layer,

wherein said saturable absorbing layer is formed to
have a band gap energy either approximately the same as, or
20 slightly smaller than, said active layer, and also to be
doped with a high concentration of N.

14. The semiconductor device according to claim 13,
wherein said saturable absorbing layer comprises N as a
25 group-V element.

15. The semiconductor device according to claim 13,
wherein said active layer, first and second cladding layers
and saturable absorbing layer comprise AlGaInP alloy
materials.

5

16. The semiconductor device according to claim 13,
wherein said saturable absorbing layer comprises an AlGaInNP
alloy material.

10 17. The semiconductor device according to claim 13,
wherein said cladding layer comprises AlGaInP and wherein an
AlGaInP intermediate layer is interposed between said
cladding layer and said saturable absorbing layer, said
intermediate layer containing less Al than said cladding
15 layer and no N.

18. The semiconductor device according to claim 1,
wherein said semiconductor device comprises a self-pulsating
semiconductor laser device for use in an optical disk system.

20